

CLAIMS

That which is claimed:

1. A method of selecting delays for a RAKE receiver, comprising:
  - searching a plurality of multi-paths to select a set of multi-path delays associated with the highest signal to interference ratios (SIRs) and/or power values;
  - averaging the respective SIR values and/or power values for the multi-path delays over a time interval;
  - selecting those multi-path delays from the set of multi-path delays and a previous set of multi-path delays that have SIR values and/or power values greater than a threshold value to generate a monitored set of multi-path delays;
  - filtering the SIR values and/or power values associated with the monitored set of multi-path delays;
  - eliminating at least one multi-path delay from the monitored set of multi-path delays as being correlated with another multi-path delay of the monitored set of multi-path delays to generate an output set of multi-path delays; and
  - providing the output set of multi-path delays to a RAKE receiver.
- 15 2. The method of Claim 1, wherein the searching, averaging, and multiplying are performed for a plurality of different cells.
- 20 3. The method of Claim 1, wherein selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value comprises:
  - selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value such that the selected multi-path delays are associated with a plurality of cells.
- 25 4. The method of Claim 1, wherein the threshold value is a first threshold value, and wherein selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values

greater than the first threshold value such that the selected multi-path delays are associated with the plurality of cells comprises:

replacing a multi-path delay associated with a first cell that has a smallest SIR value and/or power value associated therewith with a multi-path delay associated with 5 a second cell that has an SIR value and/or power value greater than a second threshold value.

5. The method of Claim 1, further comprising:

expanding the monitored set of multi-path delays by adding multi-path delays 10 to the monitored set of multi-path delays that are within a half chip of existing ones of the monitored set of multi-path delays.

6. The method of Claim 5, further comprising:

initializing the SIR values and/or power values for those multi-path delays 15 added to the monitored set of multi-path delays while expanding based on SIR values and/or power values associated with the previous set of multi-path delays.

7. The method of Claim 5, further comprising:

initializing the SIR values and/or power values for those multi-path delays 20 added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and by using a second scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay.

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8. The method of Claim 5, further comprising:

initializing the SIR values and/or power values for those multi-path delays 30 added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are within a quarter chip of an existing one of the multi-path delays, using a second scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay and are within a quarter chip of an existing one of the multi-path delays, using a third

scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are between a quarter chip and a half chip away from an existing one of the multi-path delays, and using a fourth scaling factor for respective ones of those added multi-path delays that have only a left or right 5 neighbor multi-path delay and are between a quarter chip and a half chip away from an existing one of the multi-path delays.

9. The method of Claim 1, wherein eliminating the at least one multi-path delay from the monitored set of multi-path delays comprises:

10 reducing SIR values and/or power values associated with selected ones of the monitored set of multi-path delays based on their correlation with other ones of the monitored set of multi-path delays; and

eliminating those multi-path delays from the monitored set of multi-path delays that have SIR values and/or power values less than the threshold value.

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10. The method of Claim 1, wherein the monitored set of multi-path delays is a first monitored set of multi-path delays, the threshold value is a first threshold value, the output set of multi-path delays is a first output set of multi-path delays, and wherein the method further comprises:

20 selecting those multi-path delays from the output set of multi-path delays that have SIR values and/or power values greater than the first threshold value to generate a second monitored set of multi-path delays;

expanding the second monitored set of multi-path delays by adding multi-path delays to the second monitored set of multi-path delays that are within a half chip of 25 existing ones of the second monitored set of multi-path delays;

filtering the SIR values and/or power values associated with the second monitored set of multi-path delays;

selecting those multi-path delays from the second monitored set of multi-path delays that have SIR values and/or power values greater than a second threshold value 30 to generate a third monitored set of multi-path delays;

eliminating at least one multi-path delay from the third monitored set of multi-path delays as being correlated with another multi-path delay of the third monitored set of multi-path delays to generate a fourth monitored set of multi-path delays;

selecting those multi-path delays from the fourth monitored set of multi-path delays that have SIR values greater than the second threshold value to generate an output set of multi-path delays; and  
providing the second output set of multi-path delays to a RAKE receiver.

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11. The method of Claim 1, further comprising:  
multiplying the averaged SIR values and/or power values by a scaling factor so as to reduce the averaged SIR values and/or power values before selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path 10 delays that have SIR values and/or power values greater than the threshold value to generate the monitored set of multi-path delays.

12. The method of Claim 1, wherein selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR 15 values and/or power values greater than the threshold value to generate the monitored set of multi-path delays comprises:

determining if the set of multi-path delays and the previous set of multi-path delays includes any common multi-path delays; and

associating with respective ones of the common multi-path delays a maximum 20 SIR value and/or power value of the SIR value and/or power value associated with respective ones of the common multi-path delays in the set of multi-path delays and the SIR value and/or power value associated with respective ones of the common multi-path delays in the previous set of multi-path delays.

25 13. A system for selecting delays for a RAKE receiver, comprising:

means for searching a plurality of multi-paths to select a set of multi-path 30 delays associated with the highest signal to interference ratios (SIRs) and/or power values;

means for averaging the respective SIR values and/or power values for the multi-path delays over a time interval;

means for selecting those multi-path delays from the set of multi-path delays and a previous set of multi-path delays that have SIR values and/or power values greater than a threshold value to generate a monitored set of multi-path delays;

means for filtering the SIR values and/or power values associated with the monitored set of multi-path delays;

means for eliminating at least one multi-path delay from the monitored set of multi-path delays as being correlated with another multi-path delay of the monitored

5 set of multi-path delays to generate an output set of multi-path delays; and

means for providing the output set of multi-path delays to a RAKE receiver.

14. The system of Claim 13, wherein the means for selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays 10 that have SIR values and/or power values greater than the threshold value comprises:

means for selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value such that the selected multi-path delays are associated with a plurality of cells.

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15. The system of Claim 13, wherein the threshold value is a first threshold value, and wherein the means for selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the first threshold value such that the selected multi-path delays are associated with the plurality of cells comprises:

means for replacing a multi-path delay associated with a first cell that has a smallest SIR value and/or power value associated therewith with a multi-path delay associated with a second cell that has an SIR value and/or power value greater than a second threshold value.

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16. The system of Claim 13, further comprising:

means for expanding the monitored set of multi-path delays by adding multi-path delays to the monitored set of multi-path delays that are within a half chip of existing ones of the monitored set of multi-path delays.

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17. The system of Claim 16, further comprising:

means for initializing the SIR values and/or power values for those multi-path delays added to the monitored set of multi-path delays while expanding based on SIR values and/or power values associated with the previous set of multi-path delays.

5 18. The system of Claim 16, further comprising:

means for initializing the SIR values and/or power values for those multi-path delays added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and by using a second scaling factor for 10 respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay.

19. The system of Claim 16, further comprising:

means for initializing the SIR values and/or power values for those multi-path 15 delays added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are within a quarter chip of an existing one of the multi-path delays, using a second scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay and 20 are within a quarter chip of an existing one of the multi-path delays, using a third scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are between a quarter chip and a half chip away from an existing one of the multi-path delays, and using a fourth scaling factor for respective ones of those added multi-path delays that have only a left or right 25 neighbor multi-path delay and are between a quarter chip and a half chip away from an existing one of the multi-path delays.

20. The system of Claim 13, wherein the means for eliminating the at least one multi-path delay from the monitored set of multi-path delays comprises:

30 means for reducing SIR values and/or power values associated with selected ones of the monitored set of multi-path delays based on their correlation with other ones of the monitored set of multi-path delays; and

means for eliminating those multi-path delays from the monitored set of multi-path delays that have SIR values and/or power values less than the threshold value.

21. The system of Claim 13, wherein the monitored set of multi-path  
5 delays is a first monitored set of multi-path delays, the threshold value is a first  
threshold value, the output set of multi-path delays is a first output set of multi-path  
delays, and wherein the system further comprises:

means for selecting those multi-path delays from the output set of multi-path  
delays that have SIR values and/or power values greater than the first threshold value  
10 to generate a second monitored set of multi-path delays;

means for expanding the second monitored set of multi-path delays by adding  
multi-path delays to the second monitored set of multi-path delays that are within a  
half chip of existing ones of the second monitored set of multi-path delays;

means for filtering the SIR values and/or power values associated with the  
15 second monitored set of multi-path delays;

means for selecting those multi-path delays from the second monitored set of  
multi-path delays that have SIR values and/or power values greater than a second  
threshold value to generate a third monitored set of multi-path delays;

means for eliminating at least one multi-path delay from the third monitored  
20 set of multi-path delays as being correlated with another multi-path delay of the third  
monitored set of multi-path delays to generate a fourth monitored set of multi-path  
delays;

means for selecting those multi-path delays from the fourth monitored set of  
multi-path delays that have SIR values and/or power values greater than the second  
25 threshold value to generate an output set of multi-path delays; and

means for providing the second output set of multi-path delays to a RAKE  
receiver.

22. The system of Claim 13, further comprising:  
30 means for multiplying the averaged SIR values and/or power values by a  
scaling factor so as to reduce the averaged SIR values and/or power values before  
selecting those multi-path delays from the set of multi-path delays and the previous set

of multi-path delays that have SIR values and/or power values greater than the threshold value to generate the monitored set of multi-path delays.

23. The system of Claim 13, wherein the means for selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value to generate the monitored set of multi-path delays comprises:

5 means for determining if the set of multi-path delays and the previous set of multi-path delays includes any common multi-path delays; and

10 means for associating with respective ones of the common multi-path delays a maximum SIR value and/or power value of the SIR value and/or power value associated with respective ones of the common multi-path delays in the set of multi-path delays and the SIR value and/or power value associated with respective ones of the common multi-path delays in the previous set of multi-path delays.

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24. A computer program product for selecting delays for a RAKE receiver, comprising:

a computer readable storage medium having computer readable program code embodied therein, the computer readable program code comprising:

20 computer readable program code configured to search a plurality of multi-paths to select a set of multi-path delays associated with the highest signal to interference ratios (SIRs) and/or power values;

computer readable program code configured to average the respective SIR values and/or power values for the multi-path delays over a time interval;

25 computer readable program code configured to select those multi-path delays from the set of multi-path delays and a previous set of multi-path delays that have SIR values and/or power values greater than a threshold value to generate a monitored set of multi-path delays;

30 computer readable program code configured to filter the SIR values and/or power values associated with the monitored set of multi-path delays;

computer readable program code configured to eliminate at least one multi-path delay from the monitored set of multi-path delays as being correlated with

another multi-path delay of the monitored set of multi-path delays to generate an output set of multi-path delays; and

computer readable program code configured to provide the output set of multi-path delays to a RAKE receiver.

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25. The computer program product of Claim 24, wherein the computer readable program code configured to select those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value comprises:

10 computer readable program code configured to select those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value such that the selected multi-path delays are associated with a plurality of cells.

15 26. The computer program product of Claim 24, wherein the threshold value is a first threshold value, and wherein the computer readable program code configured to select those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the first threshold value such that the selected multi-path delays are associated 20 with the plurality of cells comprises:

computer readable program code configured to replace a multi-path delay associated with a first cell that has a smallest SIR value and/or power value associated therewith with a multi-path delay associated with a second cell that has an SIR value and/or power value greater than a second threshold value.

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27. The computer program product of Claim 24, further comprising:  
computer readable program code configured to expand the monitored set of multi-path delays by adding multi-path delays to the monitored set of multi-path delays that are within a half chip of existing ones of the monitored set of multi-path 30 delays.

28. The computer program product of Claim 27, further comprising:

computer readable program code configured to initialize the SIR values and/or power values for those multi-path delays added to the monitored set of multi-path delays while expanding based on SIR values and/or power values associated with the previous set of multi-path delays.

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29. The computer program product of Claim 27, further comprising:  
computer readable program code configured to initialize the SIR values and/or power values for those multi-path delays added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those 10 added multi-path delays that have both left and right neighbor multi-path delays and by using a second scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay.

30. The computer program product of Claim 27, further comprising:  
15 computer readable program code configured to initialize the SIR values and/or power values for those multi-path delays added to the monitored set of multi-path delays while expanding by using a first scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are within a quarter chip of an existing one of the multi-path delays, using a second 20 scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay and are within a quarter chip of an existing one of the multi-path delays, using a third scaling factor for respective ones of those added multi-path delays that have both left and right neighbor multi-path delays and are between a quarter chip and a half chip away from an existing one of the multi-path 25 delays, and using a fourth scaling factor for respective ones of those added multi-path delays that have only a left or right neighbor multi-path delay and are between a quarter chip and a half chip away from an existing one of the multi-path delays.

31. The computer program product of Claim 24, wherein the computer 30 readable program code configured to eliminate the at least one multi-path delay from the monitored set of multi-path delays comprises:

computer readable program code configured to reduce SIR values and/or power values associated with selected ones of the monitored set of multi-path delays

based on their correlation with other ones of the monitored set of multi-path delays; and

5 computer readable program code configured to eliminate those multi-path delays from the monitored set of multi-path delays that have SIR values and/or power values less than the threshold value.

10 32. The computer program product of Claim 24, wherein the monitored set of multi-path delays is a first monitored set of multi-path delays, the threshold value is a first threshold value, the output set of multi-path delays is a first output set of multi-path delays, and wherein the system further comprises:

computer readable program code configured to select those multi-path delays from the output set of multi-path delays that have SIR values and/or power values greater than the first threshold value to generate a second monitored set of multi-path delays;

15 computer readable program code configured to expand the second monitored set of multi-path delays by adding multi-path delays to the second monitored set of multi-path delays that are within a half chip of existing ones of the second monitored set of multi-path delays;

20 computer readable program code configured to filter the SIR values and/or power values associated with the second monitored set of multi-path delays;

computer readable program code configured to select those multi-path delays from the second monitored set of multi-path delays that have SIR values and/or power values greater than a second threshold value to generate a third monitored set of multi-path delays;

25 computer readable program code configured to eliminate at least one multi-path delay from the third monitored set of multi-path delays as being correlated with another multi-path delay of the third monitored set of multi-path delays to generate a fourth monitored set of multi-path delays;

30 computer readable program code configured to select those multi-path delays from the fourth monitored set of multi-path delays that have SIR values and/or power values greater than the second threshold value to generate an output set of multi-path delays; and

computer readable program code configured to provide the second output set of multi-path delays to a RAKE receiver.

33. The computer program product of Claim 24, further comprising:  
5 computer readable program code configured to multiply the averaged SIR values and/or power values by a scaling factor so as to reduce the averaged SIR values and/or power values before selecting those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value to generate the monitored set of multi-path delays.  
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34. The computer program product of Claim 24, wherein the computer readable program code configured to select those multi-path delays from the set of multi-path delays and the previous set of multi-path delays that have SIR values and/or power values greater than the threshold value to generate the monitored set of multi-path delays comprises:  
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computer readable program code configured to determine if the set of multi-path delays and the previous set of multi-path delays includes any common multi-path delays; and

20 computer readable program code configured to associate with respective ones of the common multi-path delays a maximum SIR value and/or power value of the SIR value and/or power value associated with respective ones of the common multi-path delays in the set of multi-path delays and the SIR value and/or power value associated with respective ones of the common multi-path delays in the previous set of  
25 multi-path delays.

35. An electronic device, comprising:  
a path searcher module that is configured to search a plurality of multi-paths to select a set of multi-path delays associated with the highest signal to interference ratios (SIRs) and/or power values;  
30 a delay despreading and SIR calculation module that is configured to average the respective SIR values and/or power values for the multi-path delays over a time

interval and to multiply the averaged SIR values and/or power values by a scaling factor so as to reduce the averaged SIR values and/or power values;

- 5        a delay selection and monitoring module that is configured to select those multi-path delays from the set of multi-path delays and a previous set of multi-path
- 10      delays that have SIR values and/or power values greater than a threshold value to generate a monitored set of multi-path delays, to filter the SIR values and/or power values associated with the monitored set of multi-path delays; to eliminate at least one multi-path delay from the monitored set of multi-path delays as being correlated with another multi-path delay of the monitored set of multi-path delays to generate an output set of multi-path delays; and

      a RAKE receiver having fingers tuned based on the output set of multi-path delays.